

REMARKS

Claims 1-14 and 16-17 are pending in this application. By this amendment, claim 15 is cancelled without prejudice or disclaimer and claims 1 and 5 are amended. Reconsideration in view of the above amendments and following remarks is respectfully requested.

Applicants gratefully acknowledge the Office Action's indication that claim 17 defines patentable subject matter. However, Applicants respectfully submit that all pending claims are in condition for allowance.

Entry of the amended claims is proper under 37 C.F.R. §1.116 since the amendments: (1) place the application in condition for allowance (for the reasons discussed herein); (2) do not raise any new issues requiring further search and/or consideration (since claim 1 is amended to incorporate claim 15 and claim 5 is amended to correct an informality); and/or (3) place the application in better form for appeal (if necessary). Entry is thus requested.

I. Claims 1-6 and 8-16

The Examiner has rejected claims 1-6 and 8-16 under 35 USC §103(a) as being unpatentable over Streifer (US Patent 4,624,000). Claim 15 has been cancelled without prejudice or disclaimer, therefore the rejection of claim 15 is moot. The rejection of the remaining claims is respectfully traversed as the device in Streifer is a laser, and Streifer fails to disclose or suggest an attenuator, as recited in claim 1.

Applicants submit that the Streifer device is a laser whereas the claimed invention of claim 1 is directed specifically to an adjustable attenuator, which can be also be used as a phase modulator (a phase modulator being an attenuator which is switched on and off to produce a phase change). As the Streifer device is a laser device, the physics governing this device are completely different from those of an attenuator. As such, one of ordinary skill in the art would not alter features designed for a laser to improve the performance of an attenuator.

Specifically, the laser structure described by Streifer has electrodes spaced apart along the length of the laser to control the current flow across the device to provide periodic variation in the properties of the lasing medium so as to provide control of the lasing action. As an attenuator is not a laser, it does not have a gain medium or gain cavity, and thus cannot have a "longitudinal supermode."

The action of the structural devices and implants described in Streifer is to modulate the current flow at different points along the length of the waveguide to control the lasing properties of the device. The "doped areas" do not increase the change in refractive index per unit current, but have the effect of "shadowing" regions of the gain medium from the current flow through the gain medium. This reduces the electrical carrier concentration, which in turn, reduces the optical gain in the shadowed regions and thus changes the resonance of the longitudinal supermode supported by the cavity.

This is in stark contrast to the physics governing attenuators. In these types of devices, the light is absorbed "linearly" along the absorption (or attenuating) section. The absorption section is designed to be as uniform in absorption along its entire length, i.e. the light is absorbed equally in all parts of the absorption section. If two absorption sections are joined together such as to form one section, then one skilled in the art would expect that equal amounts of light would be absorbed in the first section as in the second section. Therefore, it would be expected that if these two sections were separated such that they act as adjacent independent absorption sections, then the net effect would still be the same as if they were interdependent.

The claimed invention takes advantage of this unexpected result by splitting the linear absorption section into several separate sections, the individual sections appear to become more efficient than if the absorption section had just one or more interdependent sections.

Fundamentally, the laser described in Streifer is a single p-i-n diode device, placed vertically across an optical waveguide in a standard laser diode structure. Streifer does not teach that the doped regions form separate p-i-n diodes as current injection structures. The regions 58a are referred to as "emitters" (see col. 8, line 31 of Streifer) in a similar way to the regions 18a (see col. 7, line 6 of Streifer). These are merely regions that experience higher current flow due to the shadowing effects of the "doped regions", and therefore they experience higher electrical carrier concentration and hence higher optical gain and spontaneous optical emission.

In Figure 8 of Streifer, the current injecting p-i-n structure is formed by areas 98-96-94, a single p-i-n structure. The p-p-i-n structure formed by regions 100-98-96-94 is not a current injecting region of the structure. The function of region 100 is to prevent current flow in the region 98-96 directly below region 100, this is not the function of current injection.

This is quite different from the claimed invention, in which an attenuator includes multiple independent p-i-n diodes, as the "shadowing" action of region 100 cannot create

effectively independent p-i-n structures. The effect of the "shadowing" region 100 will allow a small change in the carrier concentration in region 96, wherein in a highly non-linear device, such as a laser, such small perturbations are sufficient to force the lasing action onto a pre-determined supermode. However, this minor change in carrier concentration would have no effect whatsoever in a linear device such as an attenuator.

For at least the reasons set forth above, Applicants submit that claim 1 is allowable. Claims 2-6, 8-14 and 16 depend from claim 1, and are allowable for at least the same reasons, as well as their added features and the combinations thereof. Withdrawal of the rejection is respectfully requested.

II. Claim 7

The Office Action rejects claim 7 under 35 USC §103(a) over Streifer in view of May (US Patent 4,997,246). The rejection is respectfully traversed.

For the reasons discussed above, Applicants submit that Streifer does not disclose or suggest at least the features of claim 1, from which claim 7 depends. May does not cure the deficiencies of Streifer. May discloses the use of alternating stacks (see column 6, lines 18 to 23) to eliminate the variation in recombination time so that the response of the device to a change in electrical signal is unaffected, which is clearly different from the claimed invention.

Therefore, for at least the reasons set forth above, Applicants submit that claim 1 is allowable. Claim 7 depends from claim 1, and is allowable for at least the same reasons, as well as its added features and the combination thereof. Withdrawal of the rejection is respectfully requested.

CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is in condition for allowance. If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney, Laura L. Lee, at the telephone number listed below. Favorable consideration and prompt allowance are earnestly solicited.

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To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
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